

PATENT ABSTRACTS OF JAPAN

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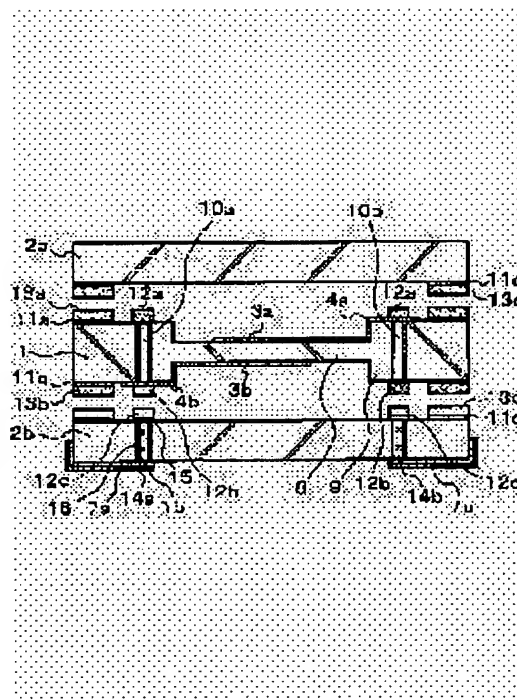
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(54) CRYSTAL OSCILLATOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a laminated crystal oscillator which is improved in its productivity.

SOLUTION: In the crystal oscillator that is produced by bonding a holding crystals on both principal surfaces of an oscillator crystal, the eutectic alloys are formed and laminated on the outer circumferences of both principal surfaces of the oscillator crystal and the outer circumference of the holding crystal opposite to the oscillator crystal. Then both eutectic alloys are melted by heat and bonded together.



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CLAIMS

[Claim(s)]

[Claim 1] The quartz resonator characterized by having formed and carried out the laminating of the eutectic alloy to both the principal plane periphery of said Xtal for vibrator, and the periphery of the field where said Xtal for maintenance counters in the quartz resonator which comes to join Xtal for maintenance to both the principal plane side of Xtal for vibrator, having carried out heating fusion of said eutectic alloy, and joining.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention makes a quartz resonator the technical field on industry, and relates to the quartz resonator of the laminating mold which joined Xtal for maintenance, and Xtal for vibrator with the eutectic alloy especially.

[0002]

[Description of the Prior Art] (Background of invention) The quartz resonator is widely used for the electronic equipment which contains a transmitter as a reference standard of a frequency and time amount. In recent years, Xtal is joined directly, it considers as a laminating mold, and the quartz resonator which measured the miniaturization is developed (reference: JP,8-330878,A).

[0003] (An example of the conventional technique) Fig. 6 is drawing of the quartz resonator explaining this kind of 1 conventional example. A quartz resonator joins Xtal 1 for vibrator, and Xtal 2 for maintenance of a lot (ab) directly, and uses them as a laminating mold. Direct junction makes the principal plane of Xtal by which mirror polishing was carried out contact, removes the OH radical of an interface by heat treatment, and is joined by Si-O-Si association (-like association between atoms).

[0004] Xtal 1 for vibrator has the excitation electrode 3 (ab) in both principal planes as monotonous, and extends the drawer electrode 4 (ab) in the periphery section (Fig. 7). Xtal 2 for maintenance (ab) has a through tube 5 (ab) as a concave corresponding to the drawer electrode 4 (ab). And while electroconductive glue, solder, etc. apply and close 6 to a through tube 5 (ab) after direct junction for Xtal 1 for vibrator, the drawer electrode 4 (ab) is derived to an outside surface. Furthermore, the mounting electrode 7 (ab) is formed in the front face of a both-ends periphery.

[0005] In such a thing, Xtal 2 for maintenance of an expansion coefficient (ab) is the same as Xtal 1 for vibrator at the same member, and stress does not occur to a temperature change, but the frequency temperature characteristic of Xtal 1 for vibrator etc. is made good. And since a configuration member is made into the minimum, a miniaturization is promoted.

[0006]

[Problem(s) to be Solved by the Invention] (Trouble of the conventional technique) However, in the quartz resonator of the above-mentioned configuration, since Xtal 1 for vibrator and Xtal 2 for maintenance (ab) are joined directly, it is necessary to grind and carry out hydrophilization also of any to a mirror plane. Therefore, mirror polishing took time amount and there was a problem on which especially productivity is reduced. Moreover, it needed to be equipped fully with the pure-water-ized facility for hydrophilization etc.

[0007] (The purpose of invention) This invention aims at offering the quartz resonator of the laminating mold which made productivity good.

[0008]

[Means for Solving the Problem] This invention forms an eutectic alloy in both the principal plane periphery of Xtal for vibrator, and the periphery of the field where Xtal for maintenance counters, carries out heating fusion, and makes it a fundamental solution means to have joined these.

[0009]

[Function] Since Xtal for vibrator and Xtal for maintenance are joined with an eutectic alloy, this invention takes neither the need of making a plane of composition into a mirror plane, nor hydrophilization processing. Hereafter, one example of this invention is explained.

[0010]

[Example] Figs. 1 and 2 are drawings explaining one example of this invention, Fig. 1 is a sectional view of a quartz resonator, and Fig. 2 is an exploded view. In addition, a jack per line is given to the same part as the before conventional example Fig., and the explanation is simple -- or it omits. A quartz resonator consists of Xtal 1 for vibrator, and Xtal 2 for maintenance (ab) as mentioned above. In this example, Xtal 1 for vibrator has a crevice in both principal planes, and makes the oscillating section 8 and the heavy-gage part of a periphery field an attaching part 9 for the thin-walled part of a central field. A through tube 10 (ab) is formed in the both-ends side of an attaching part 9. Each of these is processed by etching. And the excitation electrode 3 (ab) is formed in both the principal planes of the oscillating section 8, the drawer electrode 4 (ab) is extended to the attaching part 9 used as an opposite direction, and it extends to an opposite side through the inner circumference of a through tube 10 (ab), respectively further. Moreover, the substrate electrode 11 for junction (ab) is formed in the periphery of both principal planes.

[0011] These use a front face as gold (Au) by making chromium (Cr) into a substrate, for example, are formed in one of spatter vacuum evaporations. And on the drawer electrode 4 of both the principal planes of an attaching part 9 (ab), and the substrate electrode 11 for junction (ab), the spatter vacuum evaporation of silicon (Si) and the **** is carried out. That is, the eutectic alloy of Si-Au is formed. In addition, make the eutectic alloy of the drawer electrode 4 (ab) section into the 1st electrode connection 12 (ab), and let the eutectic alloy of the substrate electrode 11 for junction (ab) be the 1st joint 13 (ab).

[0012] In the periphery of the opposed face of Xtal 2 for maintenance (ab) which becomes the vertical side side of Xtal 1 for vibrator, the substrate electrode 11 for junction (cd) and the eutectic alloy of Si-Au are prepared as mentioned above, and it considers as the 2nd joint 13 (cd) at it. Furthermore, a through tube 14 (ab) is formed in Xtal 2b for maintenance by the side of an inferior surface of tongue at the both-ends side corresponding to two 1st electrode connection 12b by the side of the inferior surface of tongue of Xtal 1 for vibrator. And chromium and the golden substrate electrode 15 are formed in the top face, the interior, base, and side face of a through tube 14 (ab), for example, melting glass 16 is laid underground and closed.

[0013] Moreover, the eutectic alloy of Si-Au is prepared corresponding to 1st electrode connection 12b, and it considers as the 2nd electrode connection 12 (cd) at the top-face side of a through tube 14 (ab). And it considers as the mounting electrode 7 (ab), applying gold plate to the substrate electrode 15 of a side face and a base. These Xtal 1 for vibrator and Xtal 2 for maintenance (ab) are separately formed independently.

[0014] And the 1st and 2nd electrode connection 12 (bcd) is made to contact the 1st and 2nd joint 13 (abcd) list of Xtal 1 for vibrator, and Xtal 2 for maintenance (ab), and it heats. Thereby, the eutectic alloy of the 1st and 2nd electrode connection 12 (bcd) is fused and joined to 1st and 2nd joint 13 (abcd) list. That is, while the closure is carried out by the 1st and 2nd joints 13 (abcd), the excitation electrode 3 (ab) and the mounting electrode 7 (ab) connect electrically by junction of the 1st and 2nd electrode connection 12 (bcd).

[0015] Since the 1st and 2nd electrode connection 12 (bcd) is joined to 1st and 2nd joint 13 (abcd) list with the eutectic alloy of Si-Au with such a configuration, melting temperature is made to about 385 degrees C, and transition point temperature (573 degrees C) of Xtal alpha-beta is not exceeded, and the property of Xtal is maintained and it can join. In addition, golden independent melting temperature is about 1064 degrees C, and can reduce melting temperature below to transition point temperature by eutectic-izing.

[0016] Therefore, it is not necessary to carry out mirror polishing as compared with the conventional direct junction, and productivity can be raised. Moreover, it is not necessary to carry out hydrophilization processing for the plane of composition of Xtal 1 for vibrator, and Xtal 2 for

maintenance (ab), and a new facility of pure-water-sized equipment etc. is not invested.

[0017]

[Other matters] What is necessary is to just be formed in the 1 principal-plane side, although the 1st electrode joint 12 (ab) is formed in both the principal planes of Xtal 1 for vibrator and it enabled it to join to them also in respect of a gap in the above-mentioned example. Moreover, although the eutectic alloy was made into Si-Au, Au-Sn is sufficient as it, for example, and, in short, it should just be an eutectic alloy below the transition point temperature of Xtal.

[0018] Moreover, although Xtal 1 for vibrator has a crevice in both the principal plane side and made Xtal 2 for maintenance (ab) plate-like, it makes Xtal 1 for vibrator monotonous like the conventional example, and is good also as Xtal 2 for maintenance (ab). Moreover, Xtal 1 for vibrator has a crevice in a 1 principal-plane side, and its Xtal 2 for maintenance (ab) is good for it also as a plate and a concave (Fig. 3). In addition, the electrode etc. is omitted in Fig. 3. Moreover, although the 2nd electrode connection 12 (cd) was formed in the top face of the through tube 14 of Xtal 2b for maintenance (ab), as for the 2nd electrode connection 12 (cd) and the through tube 14 (ab), the location may shift (Fig. 4).

[0019] Moreover, although the substrate electrode 15 was formed in the through tube 14 (ab) of Xtal 2 for maintenance (ab) and being closed with glass (the so-called through hole), a copper paste may be laid underground, for example by printing, you may close by baking, and the (the so-called beer hall) closure means can be adopted as arbitration.

[0020] Moreover, since the Xtal front face is directly exposed in these laminating types of thing, a problem is in shock resistance, such as a deficit by contact etc. Therefore, the metal plate as a terminal etc. connects 17 (ab) to the mounting electrode 7 of a quartz resonator 19 (ab), and mold is carried out and you may make it raise reinforcement with resin 18 on the whole (Fig. 5).

[Effect of the Invention] Since this invention formed the eutectic alloy in both the principal plane periphery of Xtal for vibrator, and the periphery of the field where Xtal for maintenance counters and joined these by heating melting, it can offer the quartz resonator of the laminating mold which made productivity good.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of the quartz resonator explaining one example of this invention.

[Drawing 2] It is the exploded view of the quartz resonator explaining one example of this invention.

[Drawing 3] It is the sectional view of the quartz resonator explaining other examples of this invention.

[Drawing 4] some quartz resonators explaining other examples of this invention -- it is a sectional view.

[Drawing 5] It is the sectional view of the quartz resonator explaining other examples of this invention.

[Drawing 6] It is the sectional view of the quartz resonator explaining the conventional example.

[Drawing 7] It is the top view of the piece of Xtal explaining the conventional example.

[Description of Notations]

1 Xtal for Vibrator, 2 Metal Plate, 18 Resin, 19 Quartz Resonator Xtal for Maintenance, 3 Excitation Electrode, 4 Drawer Electrode, 5, 10, 14 Through Tube, 6 7, Such as Solder Mounting Electrode, 8 Oscillating Section, 9 Attaching Part, Substrate Electrode for 11 Junction, 12 Electrode Connection, 13 Joint, 15 Substrate Electrode, 16 Glass, 17

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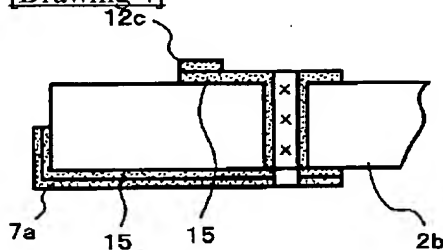
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DRAWINGS

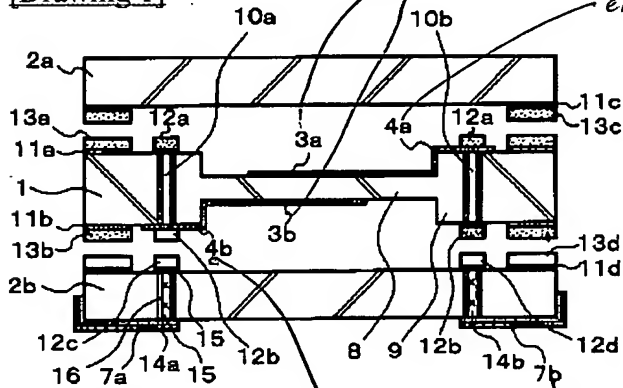
[Drawing 3]



[Drawing 4]

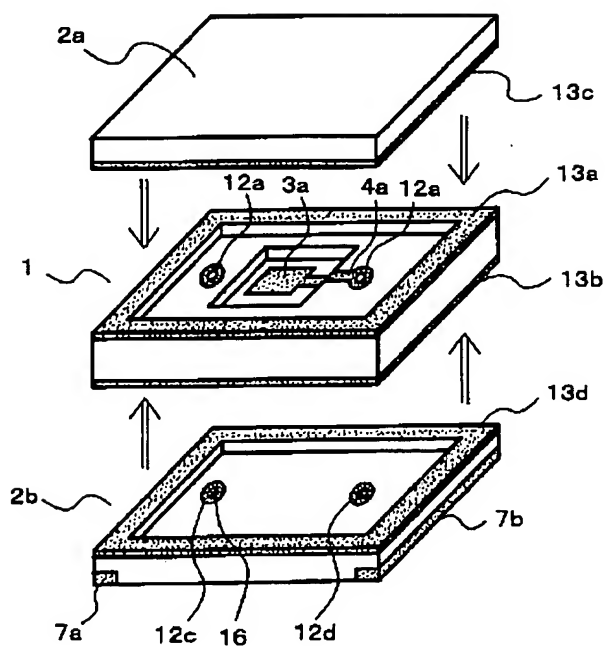


[Drawing 1]

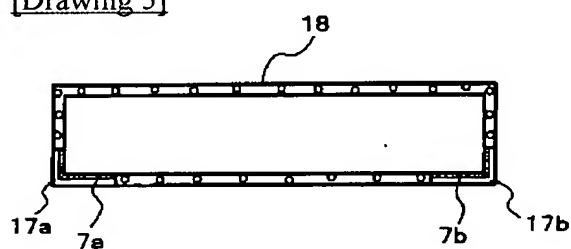


[Drawing 2]

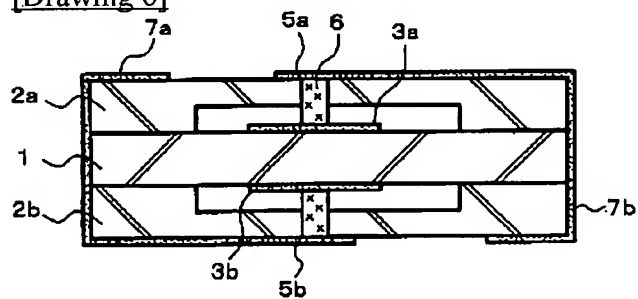
extension electrode



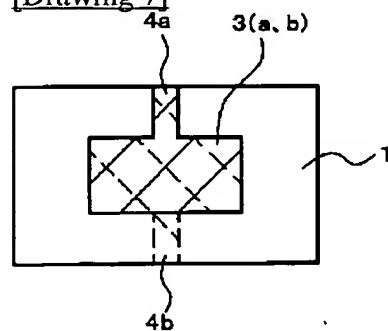
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Translation done.]